

# THE BIG THICKET OF TEXAS AS FLORISTICALLY UNIQUE HABITAT

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## ABSTRACT

The Big Thicket is floristically closely related to the southeastern United States. Using species that are unique to the Big Thicket region in Texas, we find here that most are wetland adapted. The Big Thicket is the wettest area of Texas and is edaphically, geologically, physiographically, and climatically continuous with the southeastern United States. Many eastern species appear to reach their distributional limit in southeastern Texas because of the high precipitation and wet condition that characterize this area.

## RESUMEN

El Gran Matorral está muy relacionado florísticamente con el sureste de los Estados Unidos. Usando especies que son únicas en la región del Gran Matorral en Texas, hemos encontrado que la mayoría están adaptadas a la humedad. El Gran Matorral es el área más occidental de Texas y tiene continuidad edáfica, geológica, fisiográfica, y climática con el sureste de Los Estados Unidos. Muchas especies orientales tienen su límite de distribución en el sureste de Texas debido a la alta precipitación y condiciones de humedad que caracterizan esta área.

## INTRODUCTION

The Big Thicket has been described as an area where many floras converge (see MacRoberts & MacRoberts 2004, 2007; Diggs et al. 2006 for discussion and literature). This characterization has been questioned (MacRoberts & MacRoberts 2004a; MacRoberts et al. 2007). The affinity of the Big Thicket flora is almost entirely within the eastern and especially southeastern U.S.A. (Diggs 2002; Diggs et al. 2006; MacRoberts & MacRoberts 2003, 2004a, 2007; McLaughlin 2007).

The present study originates from a statement in Diggs et al. (2006:171): “While clearly part of the southeastern U.S., the Big Thicket represents the southwestern extreme of the Southeastern Mixed Forest Province and the Outer Coastal Plain Mixed Forest Province.... Hundreds of species that occur in an arc from Virginia or North Carolina south to Florida and west to Texas reach the southern or southwestern limit of their ranges in the Big Thicket, or are confined or largely confined in Texas to the Big Thicket area. The reasons for their occurrence in the Big Thicket include the high rainfall and overall mesic conditions and the presence of specialized habitats....”

As part of a continuing effort to describe and understand the flora of the Big Thicket region (Parks & Cory 1936; Watson 1975; Ajilvsgi 1979; Marks & Harcombe 1981; Bridges & Orzell 1989; Harcombe et al. 1993; MacRoberts & MacRoberts 2004a; MacRoberts et al. 2002, 2007; Brown et al. 2005, 2006a, 2006b, in press; Diggs et al. 2006), we concentrate in this study on what is unique floristically to the Big Thicket region in Texas and how this flora relates to abiotic conditions.

## THE BIG THICKET REGION

Southeastern Texas (in which the Big Thicket occurs) is edaphically, geologically, and physiographically related to and continuous with the remainder of eastern Texas and western Louisiana (Fenneman 1938; Godfrey et al. 1973; Groat 1984; Deshotels 1976, Aronow 1981; Bureau of Economic Geology 1992; Shelby et al. 1992; and Diggs et al 2006). What is unique to the Big Thicket region within Texas is its humid subtropical climate (Bomar 1995). Southeastern Texas receives more rainfall than any other area of Texas, northwestern Louisiana, or southwestern Arkansas (Fig. 1) (Owen & Schmidly 1986; Bomar 1995; Goins & Caldwell 1995; Diggs et al. 2006). Rainfall ranges from 122 to 152 cm, making southeastern Texas the westernmost area



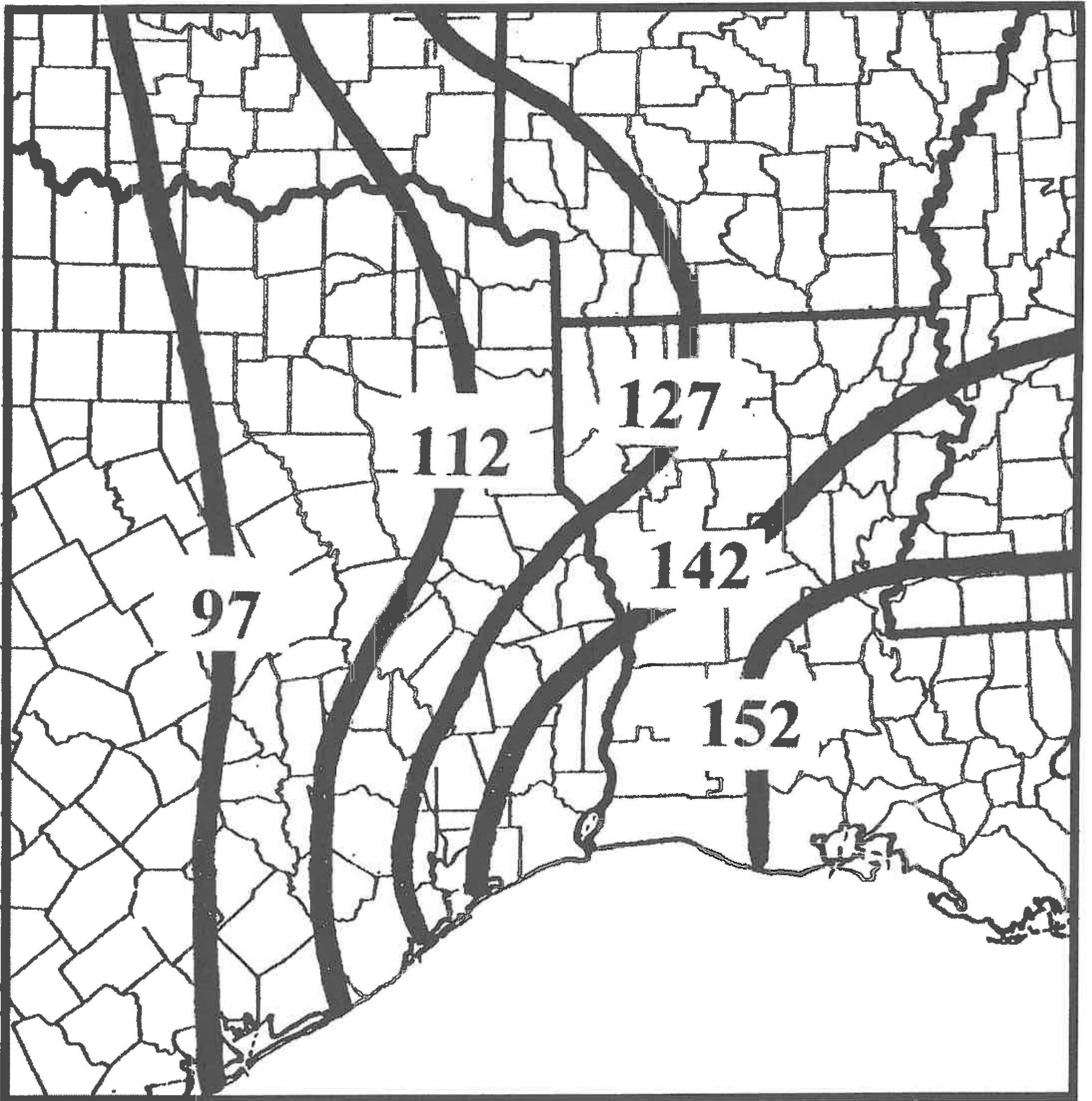


FIG. 1. Annual precipitation (in cm) of the southcentral United States.

of the eastern United States to receive such large amounts of precipitation (Diggs et al. 2006). Additionally, precipitation is well distributed through the year, the difference between driest and wettest month being only a few centimeters (Bomar 1995; Diggs et al. 2006). The only significant variation in elevation in the Big Thicket region is connected to the Willis and Fleming formations to the north where elevation rises to 110 meters and where water runoff is fairly rapid. To the south on the Lissie and Beaumont formations there is little or no relief and the area is poorly drained. Because of high precipitation and flat terrain, soils are often waterlogged, and water may stand for long periods of time in some areas, e.g., wetland pine savannas, bald-cypress sloughs, and palmetto-hardwood flats (Bridges & Orzell 1989; Marks & Harcombe 1981; Harcombe et al. 1993; Diggs et al. 2006). Additionally, because of high rainfall, the soils—Ultisols and Alfisols—are often deeply weathered. The relatively low latitude (approximately 30 degrees N) and proximity to the Gulf of Mexico result in uniformly high temperatures and a long humid growing season (Bomar 1995). South-



eastern Texas has the highest net above-ground primary productivity in Texas (Owen & Schmidly 1986), a net primary productivity comparable to the southeastern United States.

#### METHODS

Using the plant distribution maps in Turner et al. (2003) and Diggs et al. (2006), we developed a list of 98 native species “unique” to the Big Thicket region in Texas. This list consists of all species that are either confined entirely to the Big Thicket in Texas (wherever else they occur in North America) (e.g., *Spiranthes longilabris* Lindl.) or that are concentrated in but not totally confined to the Big Thicket in Texas (wherever else they occur in North America) (e.g., *Xyris scabrifolia* Harper). Using sources available (e.g., Diggs et al. 2006; MacRoberts et al. 2002), we determined in which habitats (communities) these species occur. Some species occur in more than one community; consequently, we divided their representation between those communities. Using USDA (2007), we determined the wetland status of each species. For those with no wetland rank, we either assigned one based on our personal experience, or, if we did not know the species adequately, put them in the “unknown” category. Using Kartesz and Meacham (2005) and *Flora of North America* (1993–2006), we plotted the North American distribution of the species to determine their relationship to other regions.

In order to put the Big Thicket into a larger context, using Turner et al. (2003) and Diggs et al. (2006) we developed a random selected list of 115 native species confined to eastern Texas but that were evenly distributed over the area, not just the Big Thicket, irrespective of wherever else they occurred in North America. As with the Big Thicket list, we determined, where possible, in which habitats (communities) these species occurred and their wetland status. Using the same sources as for the Big Thicket list, we plotted their North American distribution.

For the purposes of the present study, the Big Thicket is defined as Jasper, Newton, Hardin, Tyler, Polk, San Jacinto, and northern Liberty counties. This definition corresponds closely with the “biological” definition of the Big Thicket and is the same as that used by Diggs et al. (2006). Eastern Texas is defined as the area of Texas east of about 97 degrees longitude.

#### RESULTS

We found 98 species that are either unique to the Big Thicket or that are concentrated in it within Texas (irrespective of where they occur outside Texas). The community preferences, where they could be determined, are given in Table 1: 65 percent of the species favor wetland communities. The wetland status of these species, where known, is given in Table 2: 67 percent are obligate or facultative wetland species. The North American distribution of these species as a percentage of the total is given in Figure 2: 96 percent occur in Louisiana, 94 percent in Mississippi and Alabama, 91 percent in Georgia and Florida, 85 percent in South Carolina, 81 percent in North Carolina, and 56 percent in Virginia, all of which are coastal states. Percentages drop off precipitously for all other states, regions, and provinces.

The eastern Texas sample had 115 species: 19 percent favored wetland communities (Table 1) and 28 percent were obligate or facultative wetland species (Table 2) (the discrepancy between the two figures is probably due to the high number of unknowns and the high number of plants undesignated by USDA [2007]). The North American distribution of these species is given in Figure 3. The distribution is mainly in the South, but also the East in general.

#### DISCUSSION

In the past, the Big Thicket has been characterized as an area in which the floras of many regions converge. In a recent study (MacRoberts & MacRoberts 2007), we found that the Big Thicket is almost entirely southeastern with a flora composed of species typical of Louisiana, Mississippi, Alabama, and the East in general; not of species typical of western or central states. The only exceptions to this are prairie species (Brown et al. 2002). However, the Big Thicket is not the only part of the West Gulf Coastal Plain that has prairies.



TABLE 1. Habitat (community) preferences of Big Thicket and eastern Texas species.

Community/habitat	Big Thicket		East Texas	
	No.	%	No.	%
Bog/Wetland pine savanna	38.5	39	5.5	5
Upland longleaf pine savanna/Mixed woods	13.0	13	29.5	26
Pond/Marsh/Lake margin	13.0	13	9.0	8
Stream course	6.5	7	3.03	
Baygall/Seepage slope	6.0	6	4.0	3
Beech/Wet woods	6.0	6	7.0	6
Mesic Hardwood-Pine forest	6.0	6	30.0	26
Xeric sandylands	1.0	1	9.0	8
Unknown	8.0	8	18.0	15
Total	98.0	100	115	100

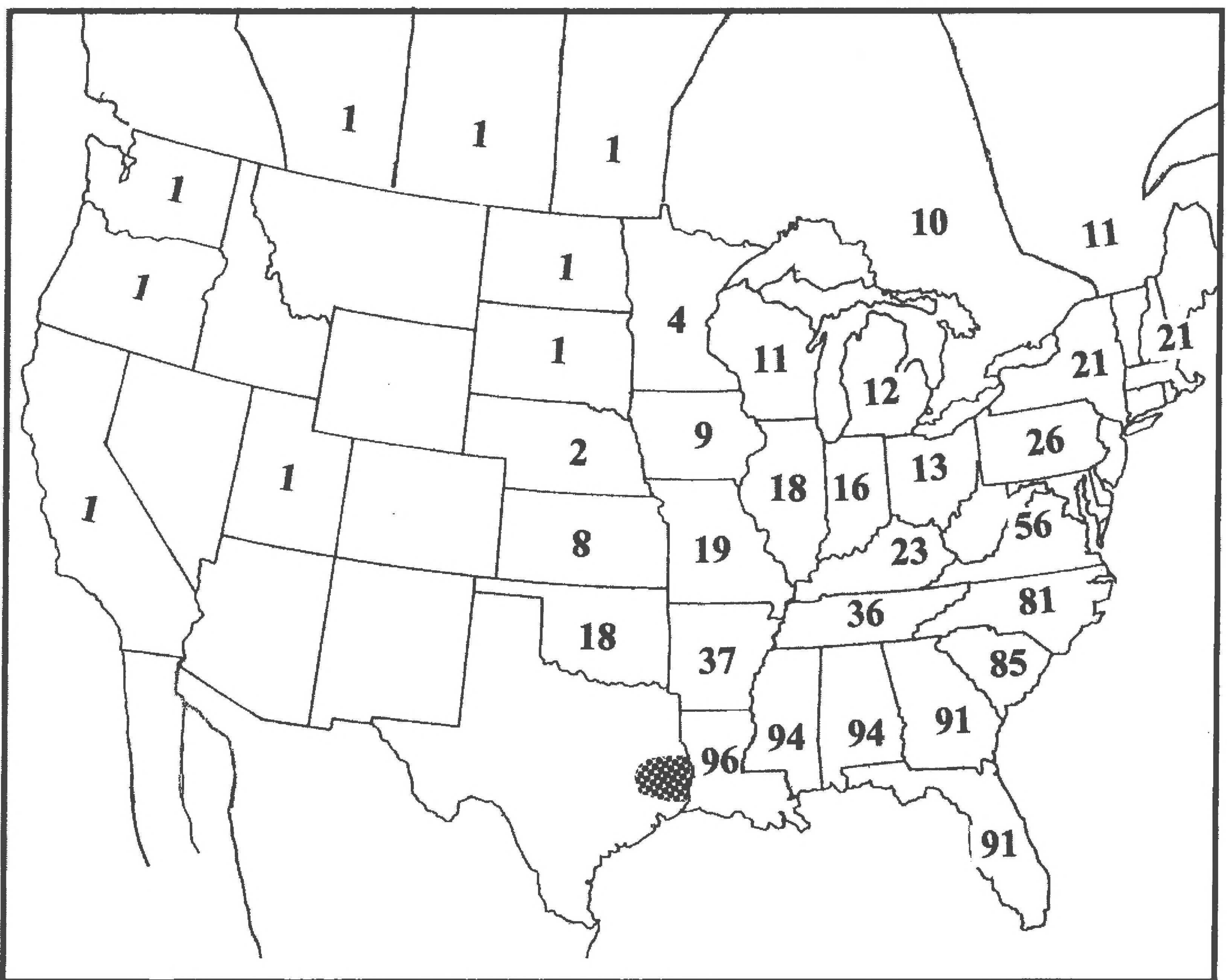


FIG. 2. North American distribution of Big Thicket "unique" species as percentage of total. Stippled area is the Big Thicket.

Prairies are scattered over southeastern Oklahoma, southern Arkansas, western Louisiana, and eastern Texas (MacRoberts et al. 2003; MacRoberts & MacRoberts 2004b).

In the present study, we have extended our earlier analysis of the Big Thicket flora by isolating species unique to the southeastern region in Texas and examining the edaphic, geologic, physiographic, and climatic



TABLE 2. Wetland status of Big Thicket and eastern Texas species (see USDA [2007] for explanation of status designations).

Status	Big Thicket		East Texas	
	No.	%	No.	%
OBL (obligate wetland)	30	31	13	11
FACW (facultative wetland)	35	36	20	17
FAC (facultative) (intermediate)	14	14	37	32
FACU (facultative upland) (dry)	12	12	30	26
UPL (upland) (very dry)	5	5	13	11
Unknown	2	2	2	2
Total	98	100	115	100

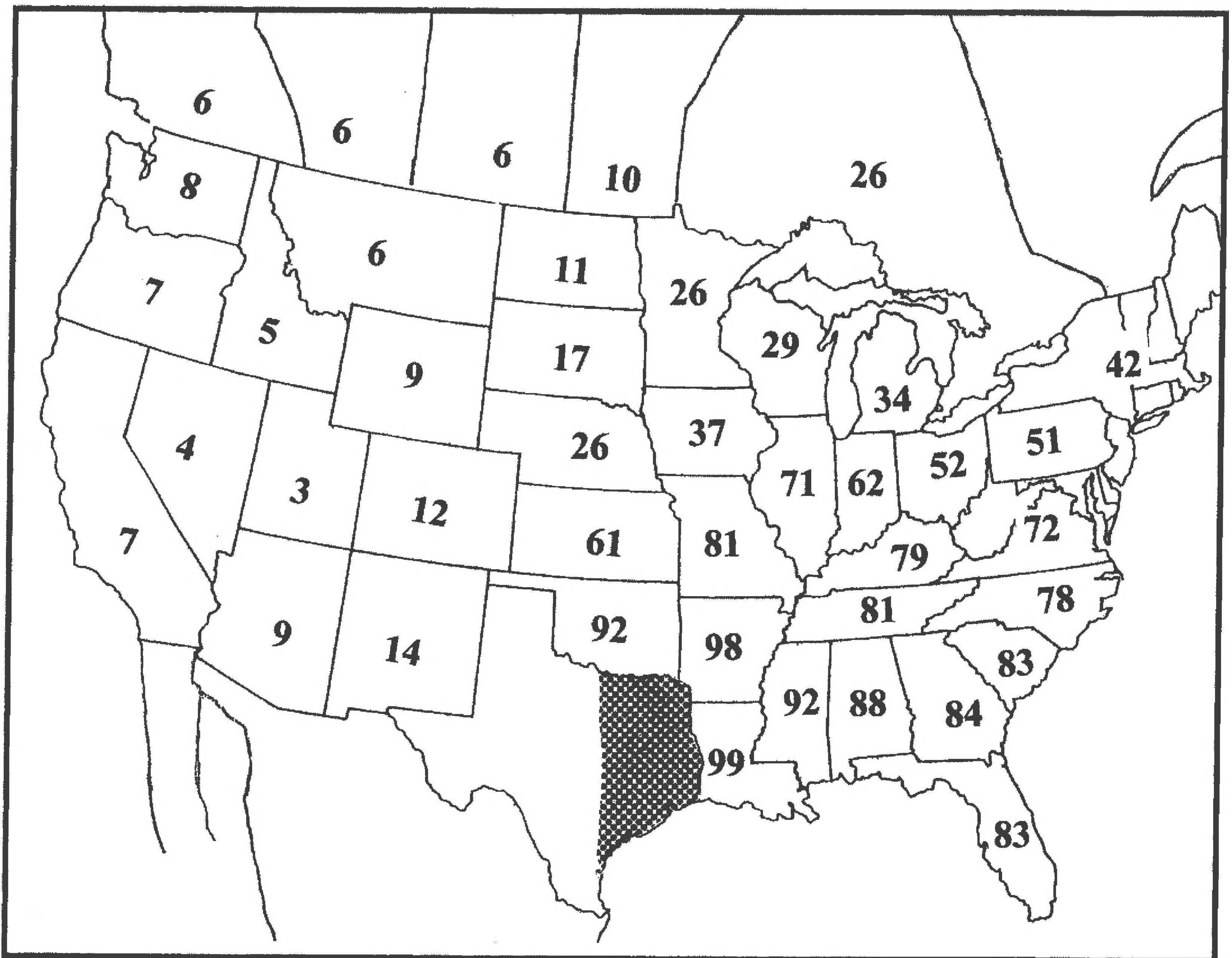


FIG. 3. North American distribution of eastern Texas species as percentage of total. Stippled area is eastern Texas.

uniqueness of the region. As might be expected, considering that southeastern Texas is humid subtropical and the wettest area in Texas, the plants are largely wetland species. Also not unexpected, considering that the southeastern United States has virtually the same climate as does southeastern Texas and that both areas are edaphically, geologically, and physiographically similar, plants that are unique to the Big Thicket in Texas are also found in Louisiana, Mississippi, Alabama, Florida, Georgia, Virginia, and the Carolinas, all of which are coastal states with high rainfall and thus deeply weathered soils.

This conclusion is supported by our analysis of the eastern Texas plant group. While two-thirds of



the species confined to the Big Thicket region are wetland species, only one-quarter of the eastern Texas group are. Additionally, the North American distribution of these species is significantly different from the Big Thicket group. Instead of hugging the southern coastal states, they are distributed across eastern North America.

Further support for the thesis that the Big Thicket is characterized floristically by wetland plants is offered by Diggs et al. (2006:169), who found that the Big Thicket is relatively rich in monocots when compared to other areas of Texas. They speculate that this difference probably relates to high percentage of mesic to wet habitats favored by many monocot species.

Another indicator of the importance of precipitation in the Big Thicket is the presence of drought-intolerant American beech (*Fagus grandifolia* Ehrh.), which reaches its westernmost limit in the United States in Montgomery and San Jacinto counties (McLeod 1975; Diggs et al. 2006).

In conclusion, southeastern Texas and thus the Big Thicket is the westward abiotic extension of the southeastern United States and thus also its westward phytogeographic extension. Many southeastern species reach their distributional limit in southeastern Texas because of its high precipitation and edaphic conditions resulting from that high precipitation.

Thus, as Diggs et al. (2006) point out, the Big Thicket represents a biological boundary and is therefore important for a number of reasons. For example, populations at the margin of a species' range are often unique genetically and represent an irreplaceable resource. Also, peripheral populations are often more sensitive to environmental change and can act as ecological indicators. More locally, the Big Thicket is important because it is a unique area within Texas, and the Big Thicket National Preserve is one of the few relatively large protected areas in the entire West Gulf Coastal Plain serving as a refuge not only for species and communities in Texas but the entire area as well.

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